Bioprospeksi Bakteri Thermofilik Penghasil *Cationic Antimicrobial Peptides* (AMPs) Sebagai Agen Antikanker dan Antimikrobia

Evy Yulianti, Anna Rakhmawati, Kartika Ratna Pertiwi

Abstrak

Berkembangnya terapi antikanker dan antimikrobia menyebabkan penemuan agen antikanker dan antimikrobia dengan mekanisme kerja yang berbeda semakin menarik untuk diteliti karena adanya resistensi sel kanker maupun sel mikrobia terhadap obat-obatan yang sudah ada. Beberapa penelitian yang telah dilakukan menunjukkan adanya senyawa protein yang dihasilkan oleh mikroorganisme yang bersifat toksik terhadap bakteri tetapi tidak untuk sel mamalia normal yang menunjukkan aktivitas melawan sel kanker. Tujuan umum dari penelitian ini adalah untuk melihat aktivitas antibakteri, antifungi dan antikanker dari protein yang dihasilkan oleh bakteri thermofilik. Pada tahun pertama penelitian ini, dilakukan identifikasi mikroorganisme penghasil *Antimicrobial Peptides* (AMP) secara morfologis dan kimiawi; fermentasi; pemisahan/pemurnian protein; melihat profil protein, uji bioaktivitas protein dan cell free extract hasil fermentasi terhadap bakteri dan fungi patogen, dan uji sitotoksik protein terhadap sel kanker T47D. Identifikasi morfologis dan kimiawi berdasar pada Bergey's manual. Uji aktivitas antimikrobia dilakukan berdasarkan terbentuknya zona jernih pada medium dengan mikrobia uji yang diberi papper disk yang ditetesi protein dan cell free extract hasil fermentasi masing-masing isolat. Mikrobia uji yang digunakan adalah *E coli*, *Staphylococcus aureus*, dan *Candida albican.* Uji sitotoksik terhadap sel kanker payudara T47D dilakukan dengan metode MTT assay. Hasil dari penelitian ini adalah diperoleh 6 isolat bakteri termofilik yang menghasilkan AMP dengan karakteristik yang berbeda-beda, yaitu isolat D94b, D153, D104c, D83, D113 dan D110. Pengujian antimikrobia menunjukkan bahwa baik protein maupun cell free ekstrak yang dihasilkan oleh 6 isolat tersebut mempunyai kemampuan antimikrobia pada mikrobia uji dengan MIC dan diameter zona hambat yang berbeda kecuali protein yang dihasilkan oleh isolat D83 dan D104c yang tidak memiliki kemampuan antibakteri terhadap *E* coli. Hasil uji sitotoksik menunjukkan bahwa IC_{50} protein masing-masing isolat terhadap sel kanker T47D berbeda beda, yaitu isolat D83 436,5 µg/mL, D94b 954,99 µg/mL, D110a 629,5 µg/mL, D104c 371,5 µg/mL, D113 501,1 µg/mL, dan D153 2,35 µg/mL.

Kata kunci : bakteri termofilik, antikanker, antibakteri, antifungi, *Antimicrobial Peptides*

Biosprospection of Thermophilic Bacteria Which Yield *Cationic Antimicrobial Peptides* (AMPs) As Anticancer and Antimicrobial Agent

Evy Yulianti, Anna Rakhmawati, Kartika Ratna Pertiwi

Abstract

The development of anticancer and antimicrobial therapy causes the invention of anticancer and antimicrobial agent with different mechanism of action more interesting to study. Because there are some resistances of microbial cell and anticancer cell toward some drugs which are already present. Some study which done before showed that there were some protein yield by microorganism had toxic nature to bacteria but had no effect to normal mammalian cell and had activity against cancer cell. The aims of this study were to saw the antibacterial, antifungi and anticancer activity of protein which was yield by themophylic bacteria. In first year, we identified the bacteria which were yield *Antimicrobial Peptides* (AMP) based on morphology of the colony and cell and physiology; fermentation; protein extraction; protein profile; bioactivity test of protein and cell free extract from fermentation to bacteria and fungi, cytotoxic test to cancer cell T47D. Morphology and physiology identification of thermophilic bacterial cell was based on Bergey's manual. Antimicrobial activity test was done based on the clear zone which was formed in the medium with pathogen. That medium was added papper disk with protein and cell free extract. The pathogen that we used were *E coli*, *Staphylococcus aureus*, and *Candida albican.* Cytotoxic test to cancer cell T47D was done by MTT assay. The result of this study were, 6 isolate of thermophilic bacteria which could produce AMP have different characteristics, there were isolate D94b, D153, D104c, D83, D113 dan D110. Antimicrobial test showed that protein and cell free extract yielded by 6 isolates have antimicrobial capacity to the pathogen with different Minimum Inhibitory Concentration and diameter of clear zone except protein yielded by isolate D83 and D104c which were have no antibacterial activity to *E* coli. The result of cytotoxic test showed that the IC_{50} of protein from each isolates to cancer cell were different, there were 436,5 μg/mL (isolate D83), 954,99 μg/mL (isolate D94b), 629,5 μg/mL (isolate D110a), 371,5 μg/mL (isolate D104c), 501,1 μg/mL (isolate D113), and 2,35 μg/mL (isolate D153).

Key words : thermophilic bacteria, anticancer, antibacterial, antifungi, *Antimicrobial Peptides*